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The Sonographic Estimation of the Renal length in Acute Renal Failure and Determination of the main Cause

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ABSTRACT

Background: Acute renal failure is one of the most health challenges in Sudan, it is widely spread and affect many people. Malaria is one of the epidemic parasitic disease in Sudan caused by P.falciparum and P.malaria which cause renal manifestations. The malaria parasite infection causes electrolyte imbalance, glomerulonephritis and acute renal failure. Ultrasonography plays a great role to assess the kidney size and pathologic changes at the renal tissue**. Objective:** The aim of this study was to evaluate the length of the kidneys in patients with acute renal failure and to determine the main cause of the disease. **Methods:** It is a retrospective and practical study deals with the patients who were suffering from acute renal failure. There were 53 patients with acute renal failure and malaria had been selected randomly from Ali Fadl and Al Salam Hospital in Khartoum State. Clinical Data was collected using designed data collection sheet including the patient's history and personal geographic information. All the patients had been scanned with ultrasound to assess the kidneys and get the renal length. Bipolar length of the kidneys had been measured with ultrasound using the technique of renal ulltrasonography. **Results**: The results of the study revealed that, there were no changes at the renal length of patients with acute renal failure. The mean length of right kidney was 11.40 cm and the left kidney was 11.48cm. There was correlation between Malaria and acute renal failure (p- value =0. 04). **Conclusion**: The study confirmed that Malaria is highly correlated with acute renal failure, and there were no significant changes in length of kidneys of the patients with acute renal failure

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INTRODUCTION

The kidneys which are normally located in the upper abdominal cavity toward the back, they play a key role in body function not only filtering the blood and getting rid of waste products, but also by balancing the levels of electrolytes in the body, thus controlling the blood pressure and stimulating the production of red blood cells. (Sukkar, 2000; Snell, 2005)

The causes of acute kidney injury can be divided into three categories prerenal (caused by decreased renal perfusion, often because of volume depletion), intrinsic renal (caused by a pathogen within the kidneys), and post renal (caused by obstructive drainage of urine distal to the kidneys). In patients who already have underlying chronic kidney disease, any of these factors, but especially volume depletion, may cause acute kidney injury in addition to the chronic impairment of renal function. Nowadays, the incidence of renal failure (acute and chronic) are increasing and growing rapidly. The causes of acute renal failure include: acute tubular necrosis, acute glomerulonephritis and acute interstitial nephritis. Acute tubular necrosis is the most common type of intrinsic acute kidney injury in hospitalized patients. The cause is usually ischemic (from prolonged hypotension) or nephrotoxic (from an agent that is toxic to the tubular cells).

As malaria is epidemic parasitic disease in Sudan, most people suffering complications. It accounts for 1 000 000–3 000 000 deaths per year in those areas (Rubin et al., 2003)

Clinically significant renal involvement is associated with infections by plasmodium falciparum and P.malariae. Infection with P.Falciparm produces only acute manifestations, ranging from asymptomatic urinary abnormalities and mild electrolyte disturbances to ARF. It had been noted that ARF occurs in 1 to 5% (Breman et al., 1994; Kumar et al, 1996) of cases of falciparum malaria. (Whaley et al., 1992)

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It was noted that P.malariae is established cause of chronic malarial nephropathy. The presence of the parasites in the renal microcirculation lead to glomerulonephritis with sub endothelial immune complex deposits containing Lg, C3 and malarial antigen. These deposits typically are seen as small lacunae in silver stained biopsy section. The disease proceeds to renal failure even after successful eradication of the infection (Barsoum &Sitprija, 1996)

As acute renal failure is a rapidly progressive loss of renal function, the underline cause must be identified and treated to arrest the progress and dialysis may be necessary to bridge the gap required for treating these fundamental causes (Bellomo et al, 2012; Zaccaria et al,2012; Medical encyclopedia, 2013; Steven et al, 2012)

The ultrasound plays a great role to evaluate the size of the impaired kidneys of patients with renal failure by assessing the length, width and depth. Since the length of the kidney is one of the most factor as it reveals how much the renal tissue atrophied. It was found that the normal length of the kidney- in adult Sudanese population is ranged between 9 to 12 cm. It is also important to evaluate the echogenicity and cortico-medullary differentiation. This is achieved by transverse and longitudinal scanning. The normal sonographic appearance of the renal cortex is homogeneous midgray or medium to low level echoes with even texture that is less echogenic than the normal liver or spleen. The contour of the normal cortex should appear smooth. The medullary pyramids appear as triangular anechoic due to the urine (Palmer, 1995)

Although ultrasound equipment may be available, sonological assessment of the kidneys in children with malaria is not routinely done, despite the fact that studies have validated the use of ultrasound in assessing renal functions in both clinical and epidemiological studies (Dinkel et al., 1985; Geelhoed et al, 2009).This study, therefore, estimates the length, using ultrasound in patients with acute renal failure who were suffering from complicated and uncomplicated malaria.

MATERIALS AND METHODS

This is a retrospective and analytical study deals with patients who had been suffering with acute renal failure (ARF). The study was conducted at Ali Fadl Hospital and Al Salam Hospital in Khartoum State from the period of January to April 2012.

There were 53 patients(male and female) with confirmed ARF had been selected randomly to satisfy the study. The data had been collected from the real images of ultrasound during the scanning. The other part of data was collected from designed data clinical sheet containing the clinical history of the patients such as frequency of malaria as reported in patient's record. The patients had been scanned with ultrasound machine using the international protocol of abdomen ultrasonography. A longitudinal scanning was performed with 3.5 MHz probe and 5 MHz for scanning thinner patients. Once the kidneys were located, the transducer was rotated at varying degrees to visualize the long axis of the kidney. Then the length of the kidney was measured from the upper pole to the lower pole with the patient in supine position and lateral decubitus.

The data had been analyzed using SPSS software and presented in tables and figures, statistical tests such as Chi square test was used. For ethical consideration, permission was taken from every patient and they had been taught that their names would not be mentioned and they were agreeing with that.

Results:

Table 1: shows clinical presentation of patients with renal failure (acute and chronic)

Clinical features	frequency	Percentage%
Edema	53	100
Loss of weight	53	100

Table 2: shows the gender distribution of patients with acute renal failure

	Frequency	Percentage%
male	27	50.9%
female	26	49.1%
valid	53	100%

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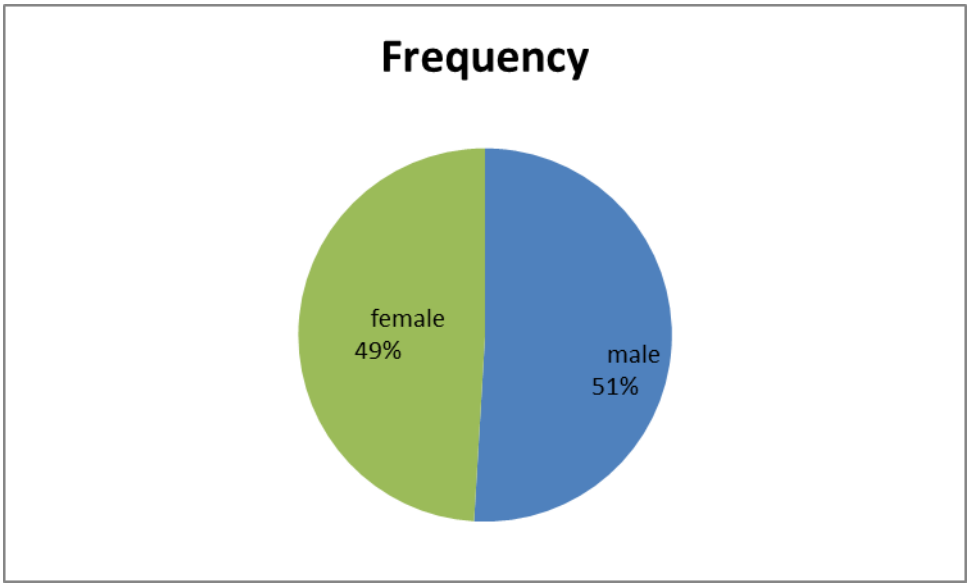

Fig. 1: shows distribution of gender of the study population**.**

Table 3: shows the age distribution of patients with acute renal failure

Age groups	Frequency	Percentage%
< 2o	1	1.9
20-29	11	20.8
30-39	31	58.5
40-49	5	9.4
50-59	5	9.4
total	53	100 %

Table 4: shows history of malaria in patients with acute renal failure

	Frequency	Percentage%
yes	49	92.5
No	4	7.5
Total	53	100

Table 5: shows the estimation of length of the right kidney in patients with acute renal failure

Length of the right kidney	frequency	percentage
8-10.5cm	12	22.64
11-12.5cm	30	56.60
13-14.5cm	11	20.75

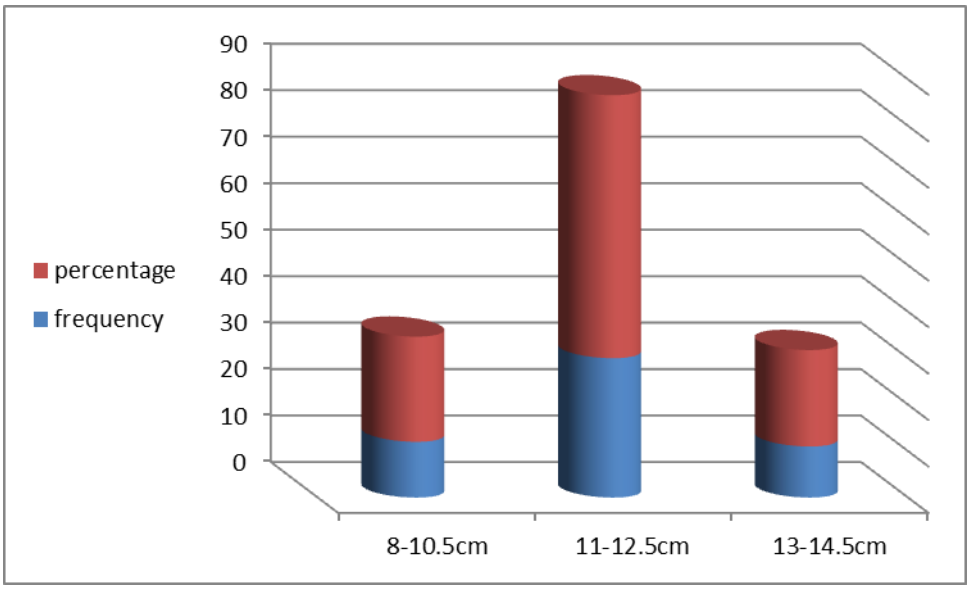

Fig. 2: shows the measurement of the kidney length distribution

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Table 6: the mean value of length of right kidney in patients with acute renal failure

	minimum	maximum	mean	Std.Deviation
Length of the right kidney in acute renal failure(cm)	8.0	13.8	11.405	1.8203

Table 7: the estimation of length of the left kidney in patients with acute renal failure

Length of the left kidney	frequency	percentage
9-10.5cm	11	20.75
11-12.5cm	31	58.49
13-14.5cm	11	20.75

Table 8: the mean value of length of left and right kidneys in patients with acute renal failure

	minimum	maximum	mean	Std.Deviation
Length of the left kidney in acute renal failure(cm)	9	13.7	11.476	1.5324
Length of the right kidney in acute renal failure(cm)	8.0	13.8	11.405	1.8203

Table 9: shows Correlation between Malaria and Acute renal failure:

	Acute renal failure		
	Yes	No	
Malaria: Yes count	49	1	50
Percentage%	89.1%	1.8%	90.9%
No count	4	1	5
Percentage%	7.3%	1.8%	9.1 %
Total count	53	2	55
% of total	96.4%	3.6%	100%

Table 9-1: Hypothesis Test using Chi-Squire test

	Value	df	Asymp.Sinificance (2 tailed)
Pearson Chi-Squire	4.203	1	0.040

df **:** degree of freedom

Interpretation of table (9-1):

According to the table above, researchers found that the potential value is 0.04 which is less than 0.05, this means there is significant difference and association exists between malaria and acute renal failure**.**

Discussion:

The acute renal failure is one of the most health problems in Sudan. It was observed that edema and loss of weight were the most common clinical features at the study population. In this study, the acute renal failure (ARF) affects mostly the people at age of 30-39 years old (58.5 %). This is the vital age and this reflect how serious the ACR. Infection with Falciparum produces acute manifestations ranging from asymptomatic urinary abnormalities and mild electrolytes disturbance to ARF requiring dialysis support. ARF occurs in 1 to 5% of cases of falciparum malaria (Sheehy and Reba, 1967).

The study showed that 92.5 % of the patients with ARF had a history of malaria infection. It was noted that there was a strong correlation between ARF and malaria. According to the study (table 9), we found that the p-value is 0.04 which is less than 0.05, this means there was significant difference and association exists between malaria and ARF. The incidence of ARF in patients with severe malaria varies widely ranging from 15% to 48 % (Mai et al., 2000) which resulted in a high fatality rate of over 70% in untreated patients (Dondorp and Day, 2007). This indicates that ARF is a serious complication of malaria.

The medical ultrasound plays a great role in measuring the length of the kidneys which is a key factor representing the degree of renal tissue damage. So, the kidney size is a valuable diagnostic parameter since it is indicator for the loss of kidney mass and therefore kidney function. In this study, the kidneys of the patients had been scanned with ultrasound to get the length of the kidneys.

The study showed that the length of the right kidney, as measured with ultrasound, is ranged between 11 to 12.5cm (56.6 %), which lies at the normal range. The range of normal reference values (mean ± 2 SD) for male and female kidney lengths is 10.7 to 14.3 and 9.5 to 13.9 cm, respectively; for male and female kidney volumes, the normal reference values (mean ± 2 SD) are 132 to 276 and 87 to 223 ml, respectively(Benjamin et al., 2006). So, the ARF did not affect the size of the kidneys. In this study, the mean value of the right kidney was 11.4cm and the mean value of left kidney was 11.5cm which were both lie within the normal range. This confirms that, there was no change at the renal length which means no reduction in renal tissue due to ARF.

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Conclusion:

The study confirmed that there were no significant changes in length of the kidneys of the patients with acute renal failure. Malaria was considered as one of the main causes of acute renal failure.

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REFERENCES

Dondorp, A.M. and N.P. Day, 2007. The treatment of severe malaria Transactions of the Royal Society of Tropical Medicine and Hygiene, 101(7): 633-634.

Medical Encylopedia A.D.A.M., 2013 Acute Kidney Failure. U.S.National Library of Medicine.2012. Retrieved.

Barsoum, R., V. Sitprija, 1996. Tropical nephrology. In: *Diseases of the Kidney*, 6th Ed., edited by Schrier RW, Gottaschalk CW, Boston, Little, Brown & Co, pp: 2221-2268.

Bejamin, C., M. Raja, F. Mario, Rubin, D. Scott, 2006. Normal Values for Renal length and Volume as Measured by Magnetic Resonance Imaging. CJASN., 2(1).

Breman, J.G., N.J. White, K.J., Eugene B, Wilson J.D., 1994. Malaria and Babesiosis. In.Isselbacher, *Harrison's Principles of Internal Medicine*, 13th ed . McGraw-Hill, New York, pp: 887-896.

Dinkel, E., Ertel M, Dittrich M, Peters H, Berres M, Schulte-Wissermann H, 1985. Kidney size in childhood sonographical growth charts for kidney length and volume. Pediatr Radiol. 15:38–43. doi: 10.1007/BF02387851

Day.N. J., N. H. Phu, N., T. H. Mai, 2000. The pathophysiologic and prognostic significance of acidosis in severe adult malaria," Critical Care Medicine, 28(6): 1833–1840.

Geelhoed JM, Kleyburg-Linkers VE, Snijders PE, Lequin M, Nauta J, Steegers EAP, van der Heijden AJ, Jaddoe VW,2009. Reliability of renal ultrasound measurements in children. Pediatr Radiol. 24:1345–1353

Klahr , Saulo; Miller, Steven BAcute Oliguria (1998). New England journal of Medicine. 338(10): 671-5

Moore, EM; Bellomo, R; Nichol, AD, 2012. The meaning of Acute Kidney Injury and its Relevance to Intensive care and Anesthesia . Anaethesia and Intensive care.. 40(6): 929-48.

Prakash J, Gupta A, Kumar O et al, 1996. Acute renal failure in falciparum malaria: increasing prevalence in some areas of India. Nephrol Dial Transplant 11: 2414–2416

Palmer.P.E.S, Manual of Diagnostic Ultrasound, 2nd edition, 1995., pp.154-155.

Ricci, Zaccaria; Ronco, Cluadio,(2012). New insights in Acute kidney failure in the critically ill. Swiss Medical Weekly. 142:w13662

Rubina N., Ejaz A., Fazal A., Anwar N., 2003: Outcome in Severe Acute Renal Failure Associated with Malaria. Oxford Journas Nephrology Dialysis Transplantation. 8 (9): 1820-1821.

Sukkar, M.Y. EL, Al Munshid.H.A., Al Radawi, M.S, 2000. Concise of human physiology.2nd edition, Blackwell Science.245-247

Snell. S. Richard, 2005. Clinical Anatomy for Medical Students.6th edition, Lippincott William and Wilkin, Walters Kluwer company (1024-1027)

Sheehy TW, Reba RC, 1967. Complications of falciparum malaria and their treatment. Ann Intern Med. 66(4):807–809.

Whaley,Robin, Harrison,Levison and Alistair, 1992. Muir's Text book of pathology, 14th edition , CRC Press, pp 394-395